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ABSTRACT

Microcomputers have presented instructional designers with an ideal tool with which to deliver individualized instruction. With a few exceptions, however, the results of cognitive styles research do not provide sufficient conclusions upon which to make design decisions. Critically missing in many studies is an explication of the conceptual binding among the information processing "deficits" of a particular style, the information processing requirements of a specific task, and the mechanism within an instructional intervention which reconciles the two. In order to form this foundation of research, programmatic research into a particular style, task, or intervention and qualitative studies which examine in depth how students with particular styles process information are needed. Seven references are listed. (Author/LMM)

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Cognitive Styles Research:

Implications for Instructional Design?

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Abstract

Microcomputers have presented instructional designers with an ideal tool with which to deliver individualized instruction. With a few exceptions, however, the results of cognitive styles research do not provide sufficient conclusions upon which to make design decisions. Critically missing in many studies is an explication of the conceptual binding among the information processing "deficits" of a particular style, the information processing requirements of a specific task, and the mechanism within an instructional intervention which reconciles the two. In order to form this foundation of research, programmatic research into a particular style, task, or intervention and qualitative studies which examine in depth how students with particular styles process information are needed.

Cognitive Styles Research:
Implications for Instructional Design?

Learner analysis is an integral stage in most models of systematic instructional design. During this stage, the designer investigates those characteristics of the target audience that should be considered in the development of instruction. Traditionally, prior knowledge of content has been the critical learner characteristic analyzed. In addition, features such as interests, general abilities, and physiological characteristics have been given attention. In some cases, designers have been hard pressed within the delivery systems available to them to individualize instruction to accommodate even variations in entry level skills and knowledge. The addition of yet another dimension --cognitive style--to consider in design has further complicated the situation.

However, the advent of a microcomputer technology makes an individualized delivery system possible. Such a technology makes accommodations to a range of individual characteristics, including cognitive styles, feasible. Microcomputer-based instruction can administer initial and periodic batteries of assessments and deliver consequent branched adaptations to critical learner characteristics. Such adaptations might include variations in attention focusing devices, informational chunk sizes, sequence and structure of graphics, and response time and types--to name but a few. Computer-based instruction has some unique attributes--high level of interaction. branching capabilites, rapid judgment capacity, dynamic text and illustration potentials, and strategy

individualize instruction. As in many other situations, however, the mechanical technology has outstripped the field's knowledge base with which to answer questions regarding its most effective use. In the case of cognitive styles the question remains, what kind of adaptations to instruction should be made for what types of learners under which circumstances?

In the late seventies Cronbach and Snow (1977) and Ausburn and Ausburn (1978) pointed out that research centainly had not established a foundation of replicable, generalizable results regarding interactions between traits, treatments, and, occasionally, tasks. Cronbach and Snow, Shapiro (1975), and Ausburn and Ausburn suggested how such research might be conducted in the future in order to obtain more conclusive results--results upon which design principles might ultimately be established.

What has been the progress in cognitive styles research since the reviews of the late seventies? Have research results built a firmer base upon which accommodations to learning styles may be based? This presentation will review some cognitive style by treatment interaction research from the past five years and suggest some alternative methodologies and questions for future research in the area.

Review of Recent Research

A review of the Current Index to Journals in Education and Dissertation Abstracts revealed hundreds of studies and articles regarding cognitive style. Many of the studies were examinations of the correlations between cognitive style and other styles, other learner characteristics, or performance in particular subject areas. However, the studies examined for this particular

presentation were those which hypothesized interactions between instructional treatments and cognitive styles. This review was by no means an intensive analysis, nor was it an exhaustive review of all studies in the area in the past five years. The purpose of this particular investigation was merely to examine which styles and treatment variables, particularly those variables pertinent to instructional design, are being investigated and what results are being reported. The hope was that the type of task could also be identified, but too often the learning task was not clearly explicated in the research reports.

Findings from a selection of fifty of these studies are generally inconclusive, contradictory, and, occasionally, surprising. However, a few observations can be based upon such a review:

1. Field independence/field dependence appears to be the most commonly examined cognitive style.

2. Some treatment variables included in these studies were

-presence/absence of behavioral objectives
-expository/discovery instructional strategy
-group/individual pacing
-high/low structure
-explict/implicit feedback
-ramdom/nonrandom sequence
-simultaneous/sequential presentation of visuals
-overt/covert response mode
-advance/post/no organizer
-presence/absence of attention directing cues
-motion/still visuals
-normal/compressed auditory rate
-positive/postive and negative examples
-pre/post question position
-photo/line drawing in illustration

-alternative media, e.g., print/film

3. Twenty-six of the fifty studies reported statistically significant style by treatment interactions.

4. Generally, a structured approach--instructor pacing, expository strategy--seems to promote better performance in field dependents than an unstructured approach. Regression slopes for field independents were much less steep than those for field dependents. In some cases interactions were disordinal, with independents performing more poorly under a structured approach.

5. Most studies were weak in explicating the specific theoretical binding among information processing traits of individuals with particular styles, information processing requirements of particular tasks, and the accommodating mediation of the instructional treatments.

Some studies did, however, attempt to hypothesize these interrelationships. Four particularly interesting studies of this category are briefly described in the following paragraphs.

Exemplary Studies

Ausburn and Ausburn (1978) report a study in which Ausburn (1975) examined the relationship between the visual/haptic processing style, a task that required the "mental comparison of images for retention," and two image presentation modes--sequential or simultaneous. Ausburn found that while both styles benefited more from the simultaneous mode of presentation, the regression slope for the haptic learners was much steeper. Ausburn concluded that the simultaneous presentation of images supplanted haptics

need to perform the complex operation of retaining multiple mental images.

Satterly and Telfer (1979) report a study in which the interaction between field independence and inclusion of an advance organizer on verbal information learning was examined. The organizer variable included three levels: no advance organizer, advance organizer, and advance organizer plus specific references to organizing properties of the organizer throughout the lesson. Finding a statistically significant interaction between cognitive style and treatment, the researcher concluded that field dependent learners benefited more from the treatment which included the advance organizer plus specific references to it than did their field independent counterparts. Evidently field dependent learners needed to have the implications of the advance organizer made explicit.

Spiro and Tirre (1980) found that field dependent students, unlike their field independent peers, were unable to utilize a schema to aid their recall and retrieval of information. The researchers conjectured that field dependent learners were unable to impose a previously-acquired, applicable schema on a new form of information--that the field-dependent students were more "text-bound" than the field independent students.

Finally, Konkiel (1981) found that color cueing aided field dependent students to acquire map skills. The facilitative effects of color-cueing was not as great for field independent students. Konkiel concluded that the color cueing helped field dependent students to disembed critical features of the map from the complex map field.

All four studies are of interest not so much because they found statistically significant interactions, but because they had a clear and specific conception of a) the cognitive requirements of the learning task, b) the processing "deficits"of learners at the extremes of a cognitive styles continuum,and c) the facilitative mechanism of the instructional treatment. Such studies have more clear implications in design of instruction to accommodate individual learning styles than studies that merely "fish" for interactions with a very general treatment and many measures of cognitive styles. In order to build studies with a sound conceptual binding, future researchers in the area may consider branching into alternative methods of research design.

Suggestions for Future Research

Clearly the first branch of future research is the continuation of experimental studies that select task, style, and intervention on clear and specific hypotheses of the cognitive processing involved. Programmatic experimental research which intensely examines the characteristics of a specific style, task, or intervention would build up a core of research results that would aid future researchers, and, ultimately, designers. These researchers may wish to employ a greater variety of measurement techniques such as eye movement studies, that would obtain more precise and "in process" assessments of learners mental activities.

To provide information about the cognitive processing involved in task, treatment, and style, some researchers may wish to consider studies utilizing qualitative,naturalistic methods. Such studies might include

1. investigations requiring learners at extremes of a cognitive style continuum to be introspective and retrospective while completing tasks which require complex transformations of instructional stimuli;

2. observations of the manner in which master teachers naturally adjust their instruction on complex tasks for students who fall at the extremes of a particular cognitive style;

3. analysis of peer tutoring by students at the extremes of a cognitive style, identifying how students with particular styles suggest attacking specific learning tasks; and

4. studies of the validity and feasibility of models for analyzing the cognitive processing requirements of learning tasks.

As a pool of information is gathered, results may provide sufficient evidence to support modifications of instruction for particular types of learners for specific types of tasks. As this foundation of information is built, there are some general questions that should be continually considered across all studies.

General Research Questions

Though individual studies may answer specific questions regarding the interactions fo treatments and styles for particular tasks, in order for designers to be able to make use of the information some general questions must also be addressed:

1. How do prior knowledge and general ability affect the interactions between cognitive styles and accommodating treatments?

2. Are styles stable across tasks and content areas?

3. Do essentially perceptual-organization styles generalize to proposition organizing tasks?

4. Is it economicatlly feasible to provide accommodating instruction? What is the cost-benefit ratio of accommodating versus nonbranching instruction?

5. What are the long term effects of supplanting information processing requirements for particular learners? Does this accommodation have long term deleterious effects?

6. Are learners senstive to and able to take advantage of accommodations which are included in instruction?

7. Are there instructional delivery systems which are antithetical to the personological dimensions of certain cognitive styles--e.g., is CDI deleterious to field dependent students who may depend upon a social context for learning?

Summary

Microcomputers have presented instructional designers with an ideal tool with which to deliver individualized instruction. With a few exceptions, however, the base of cognitive styles research does not provide sufficient conclusions upon which to make design decisions. Critically missing in many studies is an explications of the conceptual binding among the information processing "deficits" of a particular style, the information processing requirements of a specific task, and the mechanism within an instructional intervention which reconciles the two. In order to form this foundation of research, programmatic research into a particular style, task, or intervention and qualitative studies which examine in depth how students with particular styles process information are needed.

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